GEJ-3832

TROUBLE SHOOTING GUIDE

MODEL U25-U50 DIESEL-ELECTRIC LOCOMOTIVES

GENERAL ELECTRIC

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MODEL U25-U50 DIESEL ELECTRIC LOCOMOTIVES

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

LOCOMOTIVE AND CAR EQUIPMENT DEPARTMENT

GENERAL ELECTRIC

ERIE, PA.

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INTRODUCTION

This trouble shooting guide is an information pamphlet of practical hints to help solve some operating problems and to keep the locomotives "on the line." It lists some of the troubles which may occur, along with causes and probable corrections which will restore normal working order. A side view of the locomotives and a cross sectional view of the engine are in the back of the guide to aid in identifying the location of major equipments and devices.

The information contained in the guide deals with those problems which could be corrected on the road or at a terminal, with a minimum of time and repair equipment.

Certain problems are related to visual and audible warning indications received by the operator. Causes of some of these indications are common operating failures normal to operation of a road locomotive, yet easily overlooked.

HOW TO USE THE GUIDE

To quickly locate troubles of a specific nature, the problems are arranged in a sequence of events rather than in categories of major equipments and systems. These events begin with troubles in starting the engine, thru warnings and indications when the engine is running, thru failures occurring while under power and on the mainline. Miscellaneous trouble indicators and additional aids are listed in the back of the manual.

The suggested corrections are stated briefly to enable the experienced maintenance personnel to rapidly scan the lists and pinpoint the necessary correction for a specific trouble. For more detailed information on any condition or repair procedure, refer to the locomotive maintenance manual.

ENGINE STARTING

TROUBLE	POSSIBLE CAUSE	CORRECTION
FIND ENGINE IN SHUTDOWN CONDITION. Reason unknown.	1. One of the safety shutdown devices actuated 2. Manual shutdown because of suspected fault. 3. Unknown engine or electrical malfunction.	DO NOT ATTEMPT TO RESTART ENGINE UNTIL THOROUGH INVESTIGATION SHOWS THAT RESTARTING WILL NOT INCUR ADDITIONAL DAMAGE. 1. Check all safety shutdown devices. 2. Inspect engine exterior for visual fault indicators such as leaks, fire or mechanical damage. 3. Inspect crankcase and inlet manifold for evidence of failed parts. 4. Check fuel water and lube levels for trouble source. When all inspections with engine shutdown fail to reveal fault, start engine and listen for sounds of distress.
ENGINE REPEATEDLY SHUTS DOWN after complete filling of water system.	Governor shutdown plunger tripped due to trapped air in water line to shutdown device	Vent air from water line to governor shutdown device.
ENGINE CRANKS BUT WILL NOT FIRE	1. Governor not advancing fuel racks 2. Fuel system defects	1. a. Check that Low Oil Pressure and Low Water Pressure buttons on governor are reset. Push each reset button until it clicks. b. Check that Overspeed Governor has not tripped. Press reset button. c. Check fuel control linkage for binding. Free and lubricate bearings. d. Check adjustment of governor shutdown nuts. e. Check governor oil level and time delay setting. 2. a. Check for contaminated fuel or air in fuel line. b. Check for water or ice in filters.

TROUBLE	POSSIBLE CAUSE	CORRECTION
ENGINE CRANKS BUT WILL NOT FIRE	3. Engine air system defects	3. Check operation of butterfly valves and operators.
	4. Cranking speed too low.	4. a. Check battery condition. b. Check for mechanical drag, such as scored liners, bad bearings, etc.
NO BATTERY CHARGE AND LOW OIL–LOW WATER LIGHTS ARE ON and alarm bell is ringing. EC switch is in RUN but engine is shutdown.	Normal indication when engine is shutdown	Both lights will go out when engine is started, provided charging circuit is functioning properly.
ENGINE WILL NOT "TURN OVER" when engine start button is pressed. Lights stay bright.	1. Engine Control Switch (EC) in RUN position and the alarm bell is ringing.	1. Move Engine Control Switch to START position.
	2. Emergency Shutdown Switch in STOP position	2. Move switch to RUN position.
	3. Engine Start contactors (GS) not picking up	3. Check for open control circuit or burned or binding main contacts.
	4. Battery switch is not closed	4. Close battery switch.
	5. Throttle handle not in IDLE position.	5. Return throttle to IDLE.
	6. Defective battery terminal connection	6. Jumper battery power from another unit **CAUTION:** *OBSERVE POLARITY WHEN JUMPING; OTHERWISE, SEMICONDUCTORS IN THE CONTROL CIRCUITS WILL BE DESTROYED.*
ENGINE WILL NOT "TURN OVER" when start button is pressed. Lights go dim.	1. Weak or dead battery	1. Charge or replace batteries with a set of full strength.
	2. High resistance electrical contact in starting circuit.	2. Clean or tighten bad contact or connection.
	3. Mechanical friction in power plant.	3. Check engine for: a. Hydraulic lock b. Scored cylinder c. Frozen bearing d. Bent connecting rod Check generator, fan and air compressor drives for defective bearings.

ENGINE RUNNING

TROUBLE	POSSIBLE CAUSE	CORRECTION
WATER LEAKING FROM VENT PORT OF LOW WATER SHUTDOWN DEVICE on engine control governor.	Ruptured water pressure failure diaphragm	Replace outer section (Low Water) of automatic shutdown device.
WATER LEAKING FROM VENT PORT OF LOW OIL SHUTDOWN DEVICE on engine control governor.	Ruptured speeder piston oil pressure diaphragm	Replace outer section (Low Oil) of automatic shutdown device.
ENGINE WILL NOT SHUTDOWN.	1. Control breaker turned OFF	1. Turn ON control breaker.
	2. Improper setting of pump rack control linkage	2. Correct linkage adjustment.
	3. Faulty solenoid in governor	3. Repair or replace solenoid.
	4. Shutdown nuts in governor not properly adjusted.	4. Adjust shutdown nuts.
NO BATTERY CHARGE LIGHT COMES ON and alarm bell rings. Engine is running. EC switch is in RUN.	1. Battery charging circuit is not functioning properly.	1. Change fuse or change out voltage regulator cards.
	2. Defective R-C diode	2. Change out diode.
WEAK DETONATION during individual cylinder firing test	1. Defective injector	1. Change injector.
	2. Fuel pump out of time	2. Reset timing.
	3. Leaking valves or broken valve spring	3. Change cylinder.
	4. Worn piston rings or scored liner	4. Change cylinder
CYLINDER WILL NOT FIRE	1. Defective fuel injection nozzle	1. Clean nozzle holes or replace tip.
	2. Defective injection pump	2. Change pump.
	3. Low compression caused by worn rings or valves	3. Change rings or cylinder.

LOCOMOTIVE UNDER POWER

TROUBLE	POSSIBLE CAUSE	CORRECTION
LOW OIL LIGHT COMES ON and engine shuts down.	1. Low engine lube oil supply	1. Add lube oil to engine crankcase. Press reset button on engine control governor and start engine.
	2. Plugged lube oil strainer or filter	2. Clean strainer or filter.
	3. Lube oil diluted	3. Correct cause of dilution; drain oil and service with good oil.
	4. Lube oil too hot	4. Correct cause of overheating.
	5. Binding governor or fuel pump rack linkage causing engine speed to bogg down	5. Lubricate and free binding rack linkage. Repair piping leaks and add oil to engine crankcase. Press reset button on engine control governor and start engine.
	6. Lube pump relief valve defective or stuck open	6. Replace relief valve or correct faulty operation.
	7. Oil drain valves left open.	7. Close drain valves and restore lube level.
	8. Failed rubber dowels in pump drive gear on crankshaft	8. Replace rubber dowels in gear.
LOW WATER LIGHT COMES ON and engine shuts down.	1. Low water supply caused by leaks in water system	1. Repair leaks and add water to required level on water level gage. Press reset button on engine control governor and start engine.
	2. Governor of fuel rack linkage binding.	2. Locate and correct bind.
	3. Overheated engine causing water to boil	3. Check system water level, flow control valve or pump drive valve.
	4. Trip pressure setting out of calibration	4. Readjust trip pressure.
WHEELS SLIPPING EXCESSIVELY when unit is operated as lead unit of consist.	Bad rail condition	1. Move Power Limit Switch to notch 7 position until normal rail condition is regained. 2. Check and adjust sanding.
ONE OR MORE UNITS OPERATING AT LOW POWER while lead unit is at throttle notch 8.	Power Limit Switch of affected unit in notch 7 position	Move Power Limit Switch to NORMAL position.
WHEEL SLIP ALARM COMES ON	Wheels are slipping or sliding.	1. Normally automatic sanding will correct condition.

LOCOMOTIVE UNDER POWER

TROUBLE	POSSIBLE CAUSE	CORRECTION
WHEEL SLIP ALARM COMES ON		2. If slipping is prolonged; reduce throttle position until slip is corrected. 3. Check for locked axle or damage to axle alternators.
ENGINE SHUTS DOWN after throttle is advanced to 8th notch.	Engine overspeed limit exceeded causing automatic shutdown.	1. Push reset button on engine overspeed governor. Move EC switch to start and restart engine. 2. Move limit switch to 7th notch operation until overspeed limit can be reset. **NOTE:** *If engine overspeeds again, do not restart. Proceed as directed by railroad rules.*
ENGINE SHUTS DOWN DURING TRANSITION to full parallel.	1. No time to determine cause 2. Binding governor and pump rack linkage.	1. To continue operation, move Power Limit Switch to 7th notch operation until problem can be corrected. 2. Free binding linkage and lubricate bearings.
GROUND RELAY TRIPS and alarm bell rings while locomotive is being powered.	1. Grounded motor circuit 2. Grounded power circuit other than traction motor	1. If equipped with Motor Cut-out Switch, isolate grounded motor circuit and proceed at reduced power or as directed by railroad rules. 2. If no wheels are sliding, locomotive may be shutdown or run in IDLE with EC switch in START position. Report condition. If wheels are sliding, remove locomotive from consist.
PCS SWITCH TRIPS. Engine returns to IDLE and power is removed.	A safety control "penalty" or emergency air brake application has occurred.	Move throttle handle to IDLE; come out of dynamic braking. Move automatic brake valve to SUPPRESSION. Depress safety control foot pedal (if used). When application pipe builds up to normal pressure, PCS will close. Move automatic brake valve handle to RELEASE.
PCS LIGHT COMES ON and pulling power of the consist is reduced.	PCS switch is tripped on one of the trail units.	Reset PCS switch on the failed unit in the normal manner. **NOTE:** *Usually a trip switch is caused by making a hasty air equipment set-up in a vacated unit by not allowing all air blowing noises to cease after a full service brake pipe reduction is made.*

LOCOMOTIVE UNDER POWER

TROUBLE	POSSIBLE CAUSE	CORRECTION
HOT ENGINE LIGHT COMES ON and engine alarm is ringing.	1. Engine water temperature excessive	1. Add water to required level on water level gage.
	2. Locomotive operating in high ambient air	2. Operate as directed by railroad rules.
	3. Plugged strainer in flow control inlet	3. Clean strainer.
	4. Stuck flow control valve	4. Free the ceased flow control valve.
	5. Engine temperature switch ETS shorted	5. Replace switch.
	6. Radiators coated with dirt or grime.	6. Clean radiators.
	7. Defective thermostats.	7. Change thermostats.
	8. Radiator fan defective.	8. Repair or change fan.
		NOTE: *If all the above are normal, check for broken exhaust manifold.*
TRAILING UNIT WILL NOT LOAD	Automatic brake handle in wrong position	Move automatic brake handle to HANDLE OFF position and remove.
	PCS switch has tripped in trailing unit. Usually caused by making a hasty air equipment set-up in vacated unit.	Reset PCS switch in failed unit according to normal procedure.
ENGINE NOT LOADING	1. Power Control Switch (PCS) not reset.	1. Reset PCS switch
	2. Generator field circuit breaker in open position.	2. Close breaker.
	3. Loose electrical connector plug at engine control governor.	3. Tighten electrical connector plug.
	4. Power contactors not picking up because of low control air pressure.	4. a. Check that control air shut-off valve is open and drain valve is closed. Air gage should indicate prescribed pressure.
		b. Check setting of control air regulating valve. Adjust if needed.
	5. Exciter-generator not functioning properly.	5. Check exciter brushes and brush spring tension.

LOCOMOTIVE UNDER POWER

TROUBLE	POSSIBLE CAUSE	CORRECTION
ENGINE NOT LOADING OR EXCESSIVE LOADING in low throttle notches.	Open excitation circuit. a. ER resistors open. b. Load rheostat open	With engine running, set Engine Run Switch to START. Set remaining switches and breakers for normal operation. Measure voltage between XB and N wires at throttle notches 1/2 and 8. Approximate voltages are 26.3 volts at notch 1/2 and 74.0 volts at notch 8. On most U25B models these voltages may be checked at MU coupler socket pins 24 and 4. Check wiring schematic.
INCOMPLETE TRANSITION and low turbo pressure above 25 mph. 8-notch	1. Defective or sticking contacts on one or both SSR relays 2. Low fuel pressure caused by plugged fuel filter or leaking fuel line 3. Transition panel out of adjustment	1. Change out defective relay. 2. Replace fuel filter element or repair leaking fuel line. 3. Reset using calibrating instrument.
FORWARD SANDERS RUNNING CONTINUOUSLY and emergency brake application can not be reset	Double check valve sticking.	Clean or replace.
LOW TURBOCHARGER AIR MANIFOLD PRESSURE and reduced power in 8th notch	1. Power Limit Switch in notch 7 position causing reduced engine loading. 2. Fuel filters plugged 3. Bad injectors, gaskets or broken pipe 4. Fuel racks improperly set 5. Fuel pumps not calibrated or improperly timed 6. Defective turbocharger 7. Defective pressure gage 8. Bad leakage in either exhaust or intake manifolds 9. Oil bath air cleaners clogged 10. Intercoolers clogged	1. Move Power Limit switch to NORMAL position. 2. Install new fuel filters. 3. Replace defective part. 4. Reset fuel rack linkage. 5. Reset calibration or timing on affected pumps. 6. Change turbocharger. 7. Repair or replace gage. 8. Repair or change manifolds 9. Clean filters. 10. Clean intercoolers.
WHEEL SLIP LIGHT COMES on and stays on	Malfunction of wheel slip panel or axle alternator not serious enough to isolate unit	Move wheel slip cut-out switch to cut-out position. Unit will operate at reduced power with warning light on. If lead unit, light will be on only when throttle is at IDLE.

LOCOMOTIVE UNDER POWER

TROUBLE	POSSIBLE CAUSE	CORRECTION
ENGINE LOW ON POWER IN ALL NOTCHES	1. Clogged fuel-oil filters	1. Replace filter elements.
	2. Defective injection nozzles	2. Recondition or replace nozzles.
	3. Poor grade or contaminated fuel oil	3. Drain system; clean tank and fill with good fuel oil.
	Water in fuel oil	Drain and clean tank. Reprime fuel system.
	4. Improper timing of valves or fuel injection pumps	4. Retime engine.
	5. Governor and pump rack adjustment not set properly	5. Adjust linkage.
WHEEL SLIP WARNING while in dynamic braking	Wheels are sliding	Reduce throttle position until warning stops.
BLACK SMOKE PUFFS in exhaust	1. One or more defective injectors	1. Recondition or change defective injector.
	2. Fuel pump rack stuck	2. Free rack or change pump.
	3. Fuel pump rack set too high	3. Locate high rack and readjust.
	4. Fuel pump out of time	4. Adjust timing.
	5. Worn or damaged turbocharger	5. Repair or replace turbocharger.
	6. Broken or leaking manifold pipes.	6. Repair or replace manifold.
	7. Engine speed bogged down	7. Check engine operation and circuits for fault.
	8. Turbocharger rotor stuck	8. Change turbocharger.
WHITE SMOKE PUFFS in exhaust	1. Fuel pump out of time	1. Adjust timing.
	2. Cylinder with valves burned or stuck open	2. Change cylinder.
	3. Engine too cold	3. Should clear after engine warms up.
	4. Cylinder with low compression	4. Change cylinder.
	5. Overspeed butterfly valve stuck closed	5. Check that butterfly valves are fully open. Check that butterfly plate is locked on shaft.
BLUE SMOKE EXHAUST and oil out stack	Failed turbocharger bearings and seals	Replace turbocharger.

LOCOMOTIVE UNDER POWER

TROUBLE	POSSIBLE CAUSE	CORRECTION
STEADY SMOKY EXHAUST STREAM	1. Worn or leaking injectors	1. Change injectors.
	2. Late pump timing on all cylinders	2. Time engine pumps.
HEAVY EXHAUST SMOKE during transition	1. Transition speed set wrong	1. Readjust transition speeds.
	2. Defective load timing panel causing poor control of fuel rack	2. Repair or change load timing panel.
ENGINE SHUTS DOWN on false low water or low oil pressure signals.	Defective load timing panel causing engine to bog down.	Change load timing panel.
"BLOW" IN EXHAUST SYSTEM	1. Broken exhaust manifold section	1. Repair or replace manifold or manifold section.
	2. Cylinder valve stuck open or closed	2. Replace cylinder.
OVERSPEED GOVERNOR TRIPPING	1. Governor rack linkage sticking	1. Free rack linkage.
	2. Governor speed settings out of adjustment	2. Reset engine speeds.
	3. Governor speed response sluggish	3. Replace governor.
HEAVY POUND to engine under power	1. Fuel rack set too high	1. Readjust rack.
	2. Fuel pump timed too early	2. Locate faulty fuel pump and set timing.
TRACTION MOTORS SHORTED or grounded	1. Water or snow in ventilating air duct	1. Locate additional drainage holes for more effective draining.
	2. Locomotive air duct, water drain holes plugged closed	2. Clean drain holes.
LOW FUEL PRESSURE	1. Fuel filter element plugged	1. Install new fuel filter element.
	2. Fuel tank empty	2. Fill fuel tank.
	3. Pressure regulating valve sticking open	3. Clean or replace valve.
	4. Frozen fuel and water in fuel strainer or filters.	4. Clean strainer and install new fuel filter elements. Drain water from fuel tank. Apply fuel heater to unit or add .01% by volume denatured alcohol to fuel.
	5. Leak on suction side of fuel pump.	5. Repair leaking fuel line connection.

LOCOMOTIVE UNDER POWER AND MISCELLANEOUS TROUBLE INDICATORS

TROUBLE	POSSIBLE CAUSE	CORRECTION
LOW FUEL PRESSURE	6. Defective emergency fuel trip valve	6. Change valve.
	7. Seized fuel pump	7. Replace pump.
	8. Wrong electrical connections of fuel pump motor	8. Reconnect motor per instruction manual.
GROUND RELAY LIGHT COMES on during transition	Freak power surge causes GOLR Overload Relay to trip	Reset GOLR relay by pressing Ground Relay Reset.
ENGINE NOT LOADING PROPERLY ABOVE 4TH NOTCH. Indicating low turbo pressure, low load amperes and load rheostat indicator at MAXIMUM FIELD.	Open circuit or changed electrical value in generator excitation circuit	Using locomotive wiring schematic, check generator excitation circuits for fault.
NOTE: This type of fault is usually an electrical problem.		
ENGINE NOT LOADING PROPERLY ABOVE 4TH NOTCH. Indicating engine overloaded and load rheostat indicator at MINIMUM FIELD.	1. All cylinders not firing	1. Check for plugged injector/s.
	2. Fuel pump timing not properly adjusted	2. Check pump timing.
	3. Auxiliary loads - compressor or fan gear drive in distress	3. Check for worn bearings or low lube oil level.

NOTE: ***This type of fault*** **is usually a diesel engine or mechanical problem.**

MISCELLANEOUS TROUBLE INDICATORS

TROUBLE	POSSIBLE CAUSE	CORRECTION
OIL SCUM in water tank sight glass	1. Leaking oil cooler	1. Repair or replace cooler.
	2. Leaking oil line in turbocharger intermediate casing	2. Replace turbocharger.
	3. Cylinder combustion chamber gasket leak, cracked cylinder liner or casting	3. Replace cracked cylinder of defective gasket.
DILUTED LUBE OIL	1. Defective injection nozzles	1. With engine at IDLE, pull each fuel rack. Failure to fire heavily indicates faulty injector or late pump timing. **NOTE:** *If injector seems to fire when rack is pulled out, but not at IDLE rack reading, check pump-rack setting.*
	2. Loosen or broken fuel pump tappet umbrella	2. Tighten or replace umbrella.
	3. Plugged fuel drain line	3. Check that header and cylinder drains are open.

VISUAL INDICATORS OF TROUBLE

1. Water leaks or oil dripping
2. Chromate stains
3. Smoke puffs in exhaust (black, blue or white)
4. Soot stains
5. Blue coloring on bearing surfaces
6. Crankcase sediment containing metal particles

AUDIBLE INDICATORS OF TROUBLE

1. Heavy pound, rap, knock or clatter
2. Hiss or puffing sounds
3. Grinding noise
4. Vibration sounds

LOCATING CYLINDER WATER LEAK

1. Remove water discharge header from engine.
2. Fill cooling system to top of cylinder discharge water pipes.
3. Trip LOW OIL button on engine governor.
4. Crank engine and watch for water blowing from discharge pipe of defective cylinder.

NOTE: *If necessary, pull out rack and fire cylinders individually until leaking cylinder is found.*

RESTORING NORMAL OPERATION AFTER SAFETY CONTROL PENALTY

After a penalty brake application has occurred, normal locomotive operation is restored in the following manner:

1. Move throttle handle to IDLE.
2. Move automatic brake valve handle to SUPPRESSION.
3. Depress safety control foot pedal.
4. After application pipe has built up to normal pressure, move automatic brake valve handle to RELEASE.

DETECTING AND RESETTING TRIPPED CIRCUIT BREAKER

A circuit breaker is tripped when the handle or toggle switch is positioned midway between the ON and OFF position.

To reset a tripped breaker, move the toggle or handle fully down to the OFF position. Then move it to ON. If the breaker should trip again, allow it to cool for several minutes then repeat the resetting procedure. Repeated tripping calls for investigation and correction of a more serious electrical fault.

CAUSES OF MOTOR OR GENERATOR FLASHOVER

1. Excessive overspeeding the machine
2. Eccentric or rough commutation
3. Low brush-spring tension
4. Broken, sticking, or worn out brushes

5. Dirt, carbon dust, and slivers of copper between the commutator segments

6. Going over crossings at high power

CAUSES OF BROKEN BRUSHES

1. Rough commutator, burnt spots, flat spots and high bars

2. Low brush spring tension

3. Motor vibration caused by slipping wheels, rough track, or loose motor-nose suspension

4. Commutator "out-of-round"

CORRECTION FOLLOW-THROUGH PROCEDURES

To avoid secondary troubles after changing out failed or defective engine parts, proceed as follows:

AFTER PUSH ROD CHANGE

1. Look for stuck valves and metal pieces in push rod tunnels.

2. Readjust valve tappet clearance.

3. Inspect other push rods in same cylinder.

AFTER EXHAUST MANIFOLD CHANGE

1. Look for broken metal pieces in manifold pipe.

2. Check turbocharger for free turning rotor.

ADDITIONAL TROUBLE SHOOTING AIDS

AFTER CYLINDER CHANGE

1. Check for bent or broken valves and rubbed or broken skirt.

2. Check for bent push rod.

3. Check fuel pump timing and rack adjustment.

4. Inspect open sections of inlet manifold for broken metal parts.

5. Inspect condition of piston head, skirt and rings.

AFTER FUEL PUMP OR INJECTOR CHANGE

1. Check condition of ferrules on high pressure line.

2. If injector is plugged, change injection pump.

3. Check that mounting bolts do not bottom.

4. Check that extra copper gaskets have not been used.

5. Check pump timing and rack adjustment.

6. Be sure all mounting bolts are tight.

AFTER TURBOCHARGER CHANGE

1. If rotor has been stuck, check for failed valves.

2. Check for foreign material in exhaust pipes.

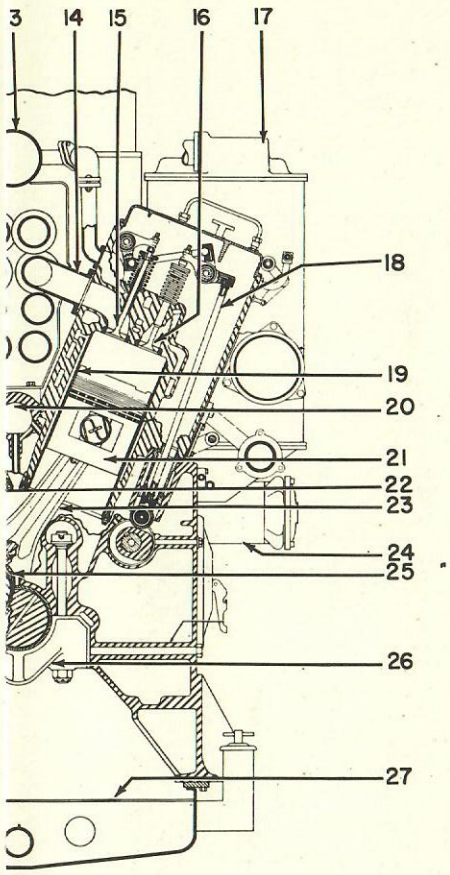
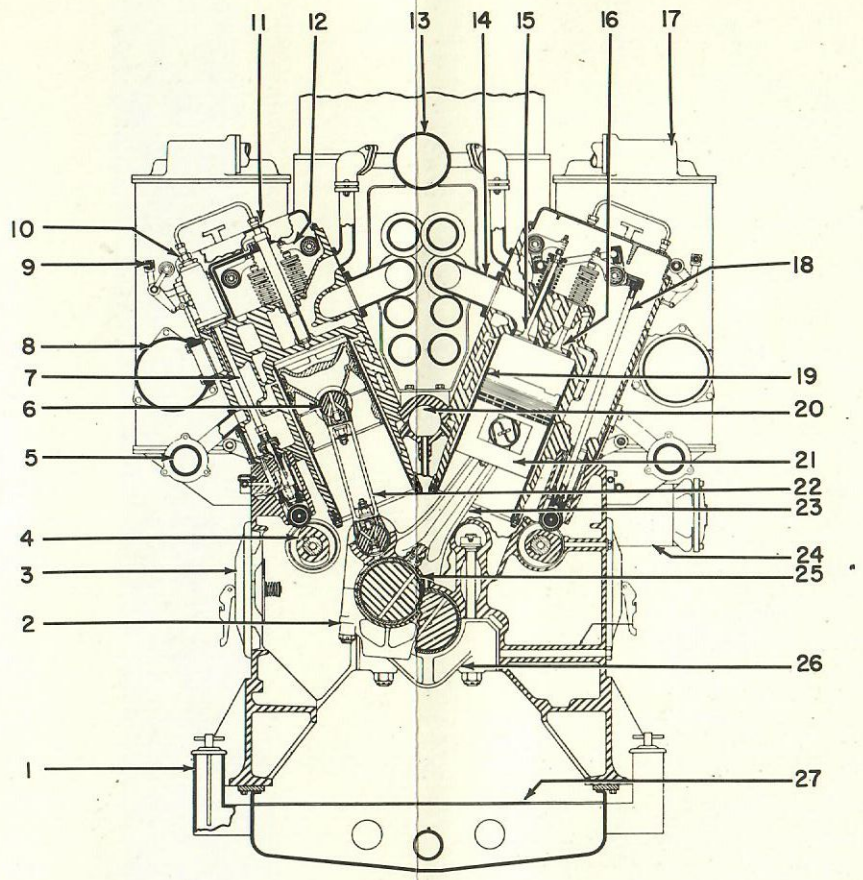


Fig. 1 (E-11925)

ction pump
ctor
rm
scharge header
manifold pipe
valve
lve
rcooler
sh rod

19 Cylinder liner
20 Main lube-oil header
21 Piston
22 Articulated connecting rod
23 Master connecting rod
24 Lube-oil strainer
25 Master connecting-rod bearing
26 Main bearing cap
27 Oil pan

Fig. 1. Engine parts reference (G-E 7FDL16)



1 Lube-oil fill pipe
2 Master connecting-rod bearing cap
3 Crankcase inspection cover
4 Camshaft
5 Water-inlet manifold
6 Piston pin
7 Fuel pump push rod
8 Air-intake manifold
9 Fuel header
10 Fuel injection pump
11 Fuel injector
12 Rocker arm
13 Water-discharge header
14 Exhaust-manifold pipe
15 Exhaust valve
16 Intake valve
17 Air intercooler
18 Valve push rod
19 Cylinder liner
20 Main lube-oil header
21 Piston
22 Articulated connecting rod
23 Master connecting rod
24 Lube-oil strainer
25 Master connecting-rod bearing
26 Main bearing cap
27 Oil pan

Fig. 1. Engine parts reference (G-E 7FDL16)

Fig. 2 (E-11830)

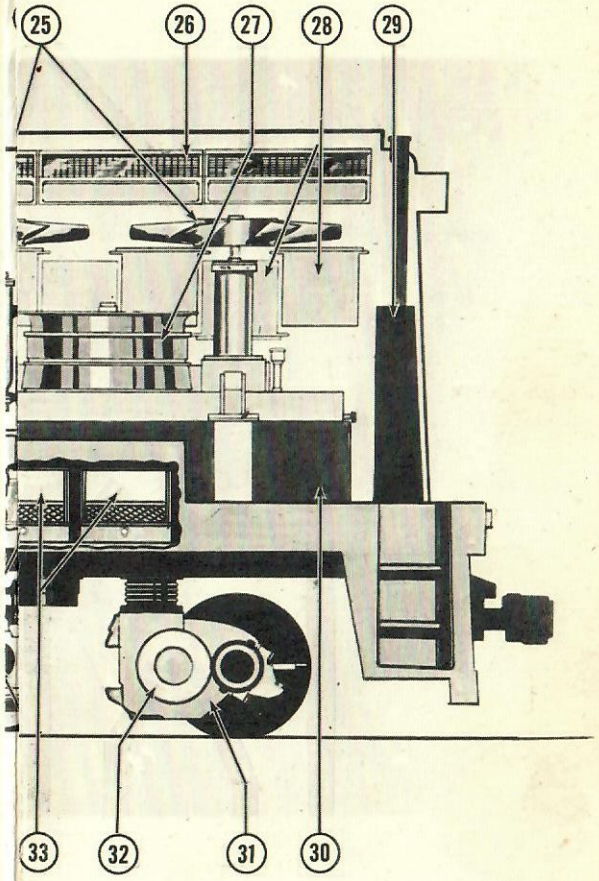


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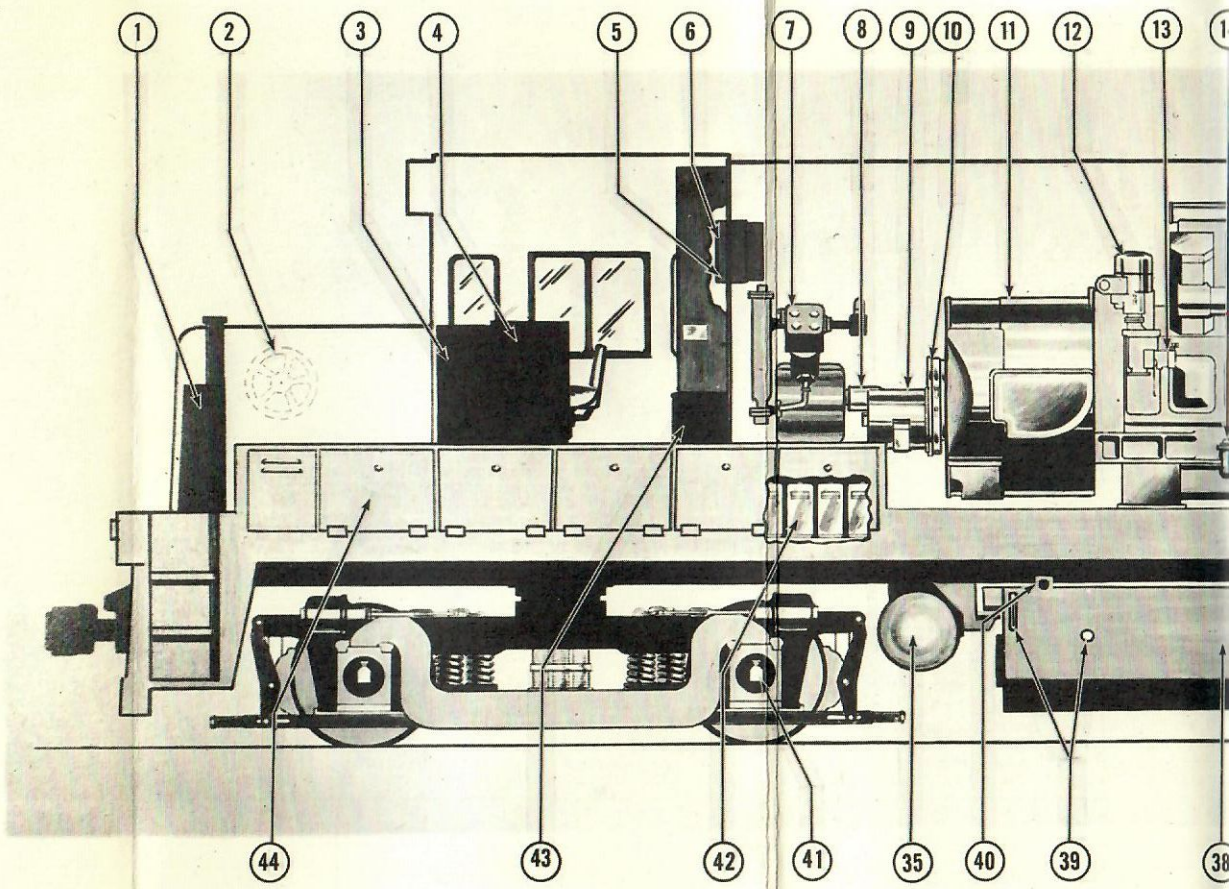
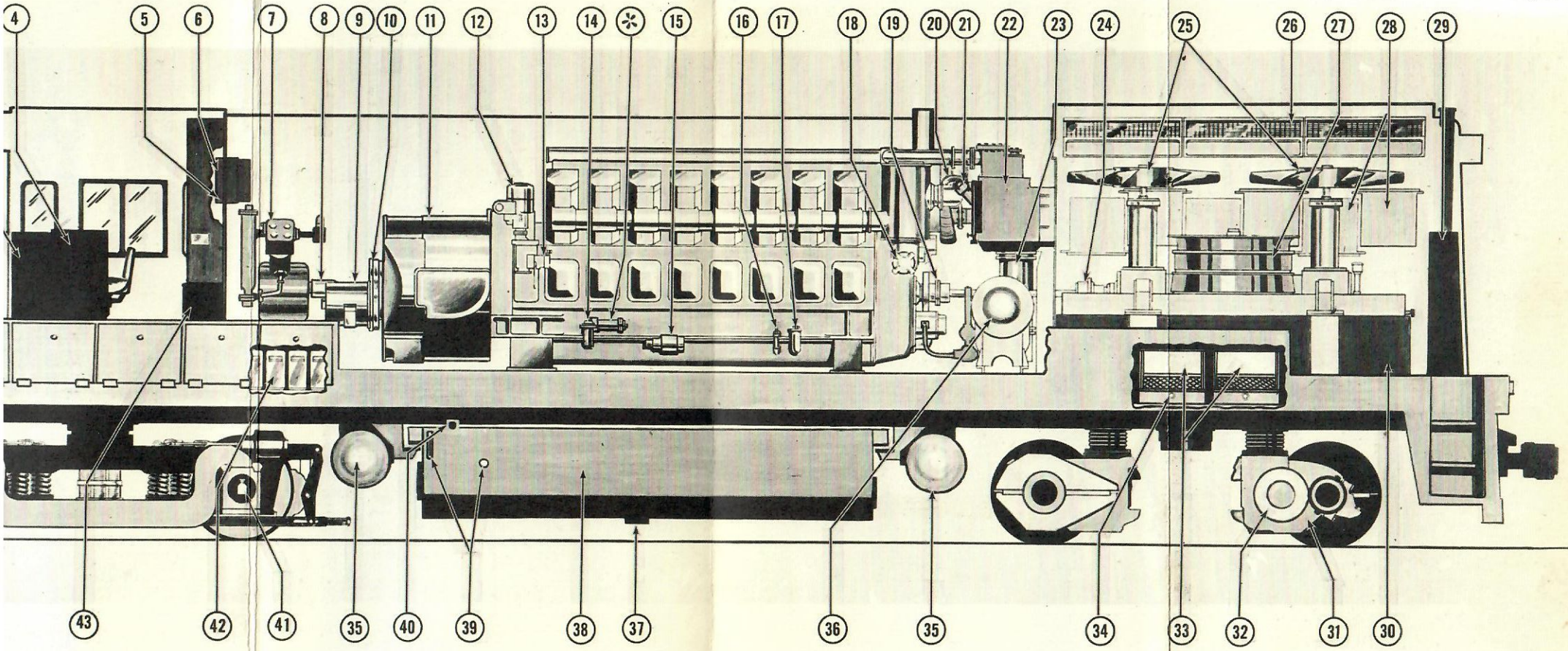
Fig. 2. Apparatus location (U25)

Fig. 1 (E-11830)



1 Sand box
2 Hand brake
3 Operating controls and gage panel
4 Air-brake controls
5 Emergency fuel cut-off button
6 Engine control panel
7 Air compressor
8 Flexible coupling
9 Auxiliary generator (left side)
exciter (right side)
10 Traction-generator gear case
11 Traction-generator
12 Engine control governor
13 Overspeed governor
14 Fuel strainer
15 Fuel booster pump
16 Lube-oil dip stick (both sides)
17 Lube-oil filter
18 Lube-oil strainer
19 Flexible coupling
20 Turbocharger
21 Water fill (pressurized)
22 Water storage tank

*Fuel heater (optional)



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12 Engine control governor
13 Overspeed governor
14 Fuel strainer
15 Fuel booster pump
16 Lube-oil dip stick (both sides)
17 Lube-oil filter
18 Lube-oil strainer
19 Flexible coupling
20 Turbocharger
21 Water fill (pressurized)
22 Water storage tank
23 Lube-oil cooler
24 Flexible coupling
25 Radiator fans
26 Radiator
27 Equipment blower
28 Braking resistors
29 Sand box
30 Primary air cleaner
31 Traction-motor gear case
32 Traction motor
33 Engine air filters
34 Air-filter oil level
35 Main air reservoir
36 Lube-oil filter
37 Fuel-tank sump
38 Fuel tank
39 Fuel-level gages
40 Fuel-tank fill (both sides)
41 Axle alternator (all axles)
42 Batteries (right side)
43 Cab heater
44 Control compartment (left side)
air-brake compartment (right side)

Fig. 2. Apparatus location (U25)

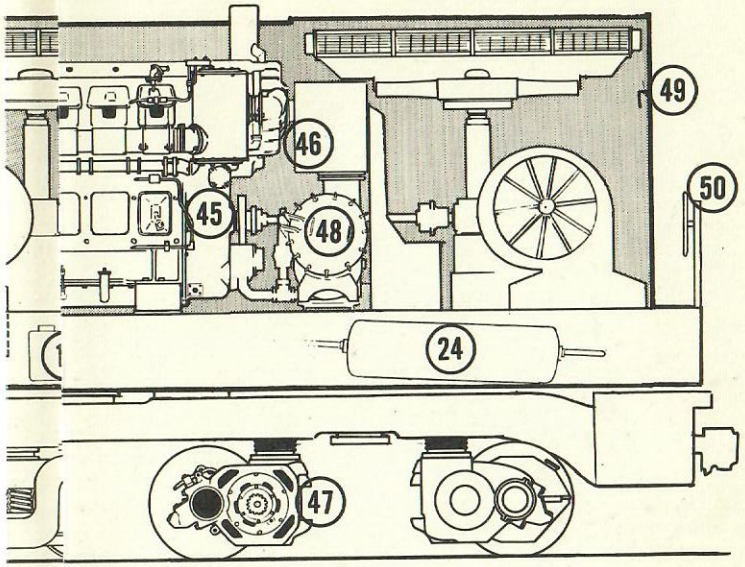

Fig. 3 (E-13086)

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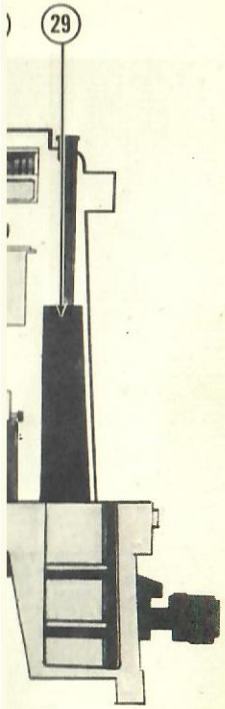
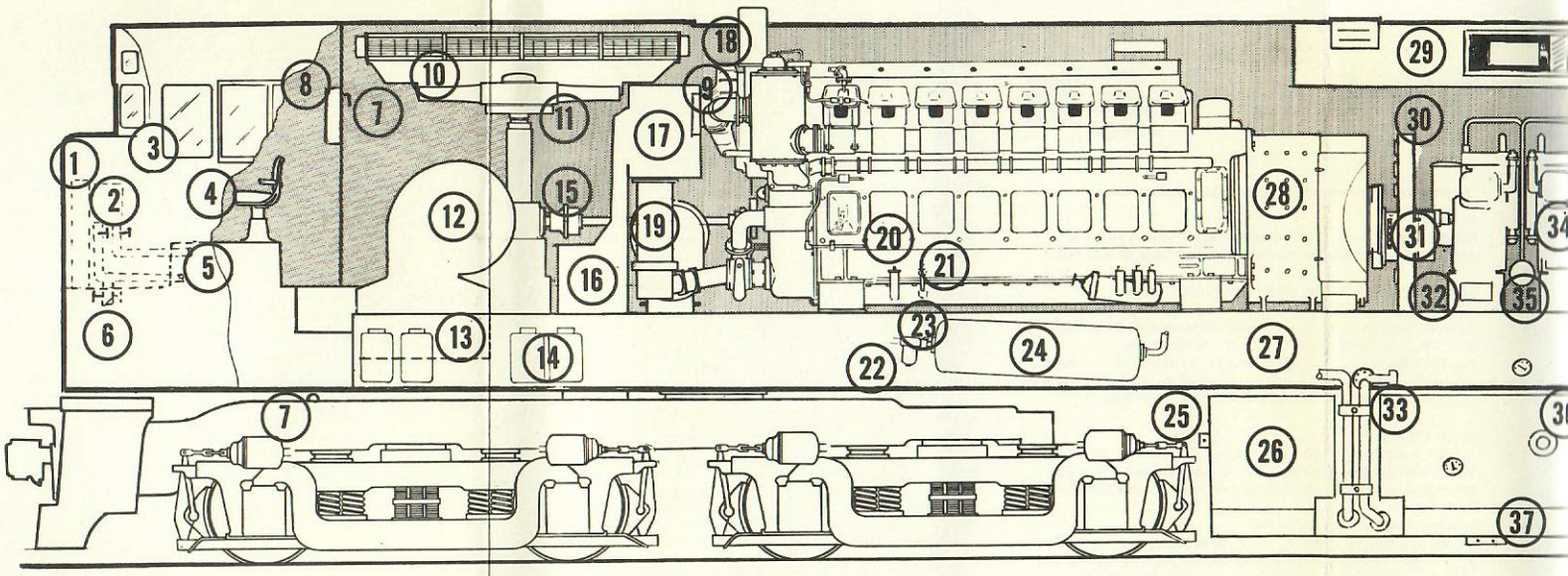
ol (rear)

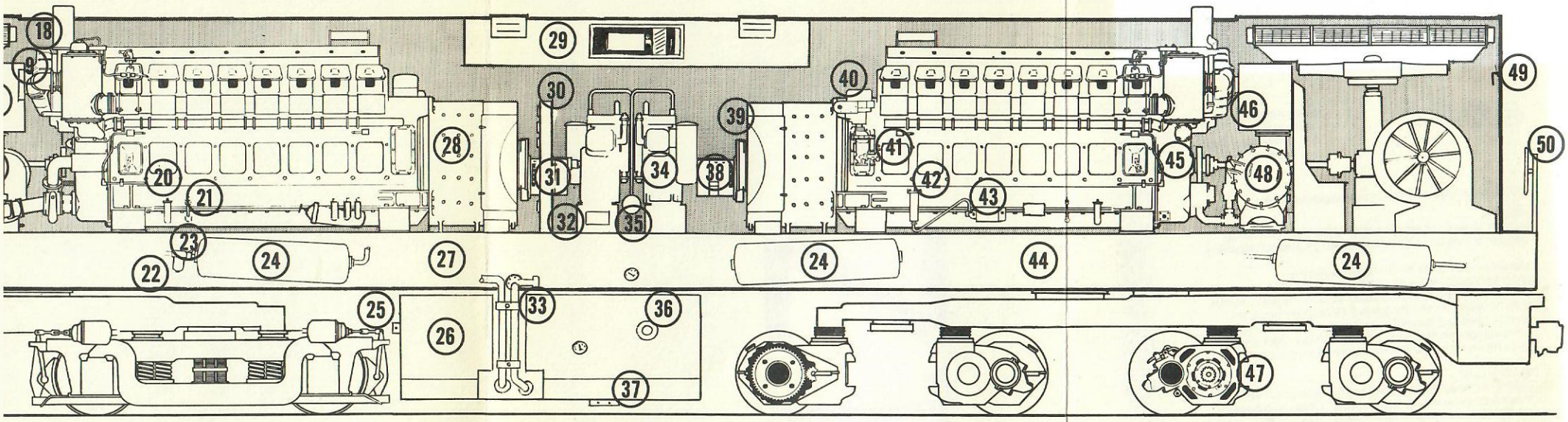
Fig. 3. Apparatus location (U50)



ıtus location (U25)



1. Cab heater
2. Cab heat regulating valves
3. Operating controls and gage panel
4. Air brake controls
5. Air equipment rack (right and left)
6. Cab heater drain valve
7. Battery charging receptacle (IF equipped)
8. Engine control panel
9. Manual shutter control (front)
10. Radiator
11. Radiator fan
12. Front equipment blower
13. Front primary air cleaner
14. Battery compartment (right and left)
15. Flexible coupling
16. Secondary air cleaner (dry or oil bath)
17. Water storage tank
18. Turbocharger
19. Lube-oil cooler
20. Lube-oil filler (both side
21. Lube-oil dipstick (both s
22. "H" air filter
23. Main reservoir cut-out c
24. Main air reservoir
25. Emergency fuel-trip butt
26. Fuel tank
27. Front control compartm
28. Traction generator
29. Dynamic braking blowers
30. Engine gage panel
31. Auxiliary generator
32. Water motor-pump set
33. Fuel level gages
34. Air compressor



.b heater
.b heat regulating valves
erating controls and gage panel
r brake controls
r equipment rack (right and left)
b heater drain valve
ttery charging receptacle (IF equipped)
gine control panel
nual shutter control (front)
diator
diator fan
ont equipment blower
ont primary air cleaner
ttery compartment (right and left)
exible coupling
ondary air cleaner (dry or oil bath)
ter storage tank

18. Turbocharger
19. Lube-oil cooler
20. Lube-oil filler (both sides)
21. Lube-oil dipstick (both sides)
22. "H" air filter
23. Main reservoir cut-out cock
24. Main air reservoir
25. Emergency fuel-trip button (both sides)
26. Fuel tank
27. Front control compartment (right side)
28. Traction generator
29. Dynamic braking blowers and resistors
30. Engine gage panel
31. Auxiliary generator
32. Water motor-pump set
33. Fuel level gages
34. Air compressor
35. Heat exchanger (IF equipped)
36. Fuel tank fill (both sides)
37. Fuel tank sump
38. Exciter
39. Traction-generator gear case
40. Engine control governor
41. Overspeed governor
42. Fuel strainer
43. Fuel booster pump
44. Rear control compartment (right side)
45. Lube-oil strainer
46. Water fill (pressurized)
47. Traction motor
48. Lube-oil filter
49. Manual shutter control (rear)
50. Handbrake

Fig. 3. Apparatus location (U50)